MONITORING WATER QUALITY OF THE WABASH RIVER IN ADAMS COUNTY USING A RAPID BIOASSESSMENT TECHNIQUE

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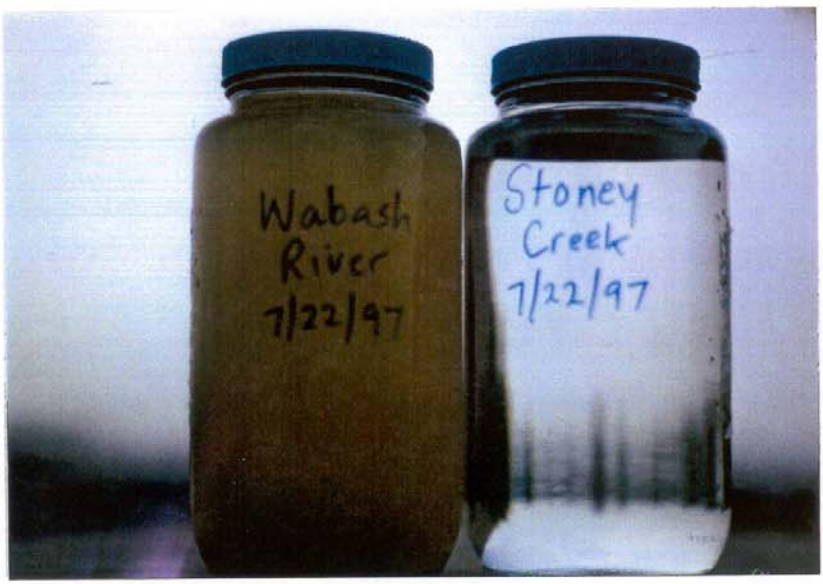

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EXECUTIVE SUMMARY

A rapid bioassessment technique was used to determine the degree of biological impairment present in the upper Wabash River and its larger tributaries in Adams County, Indiana during 1997. This was the second of two studies conducted within 12 months on this watershed. The bioassessment was conducted to help prioritize areas which could most benefit from land treatments to restore water quality in the area.

The Wabash River as it enters Adams County from Ohio was moderately impaired by both habitat and water quality degradation. The river's biological condition generally improved as it flowed through the county. Several tributaries in the county were also slightly or moderately impaired by degraded aquatic habitat and/or water quality problems. Each of the study sites was characterized by higher proportions of "sediment-tolerant" animals and fewer kinds of "sediment-intolerant" animals than the regional reference stream. This indicates that sediment loading may be too high at these sites. There were also signs of excessive nutrient inputs and of oxygen-demanding pollutants at some sites.

The biotic index scores of most sites had not changed significantly from those measured in an identical 1996 study. Water quality at one tributary site (Limberlost Creek) had declined from slightly to moderately impaired. One Wabash River site (at Vera Cruz) had improved from slightly impaired to no impairment. Another Wabash River site (upstream from Geneva) was obviously impaired by a discharge of suspended sediment from a gravel quarry operation.

Recommendations for improvement of water quality in the upper Wabash River watershed include protection of the vegetative border along the river, stabilizing severely eroding banks at some sites, discouraging channelization and direct access to the stream by livestock, implementation of land treatments to reduce nutrient and sediment inputs, working with a local gravel quarry to reduce sediment imputs, and continued monitoring to document improvements over time.

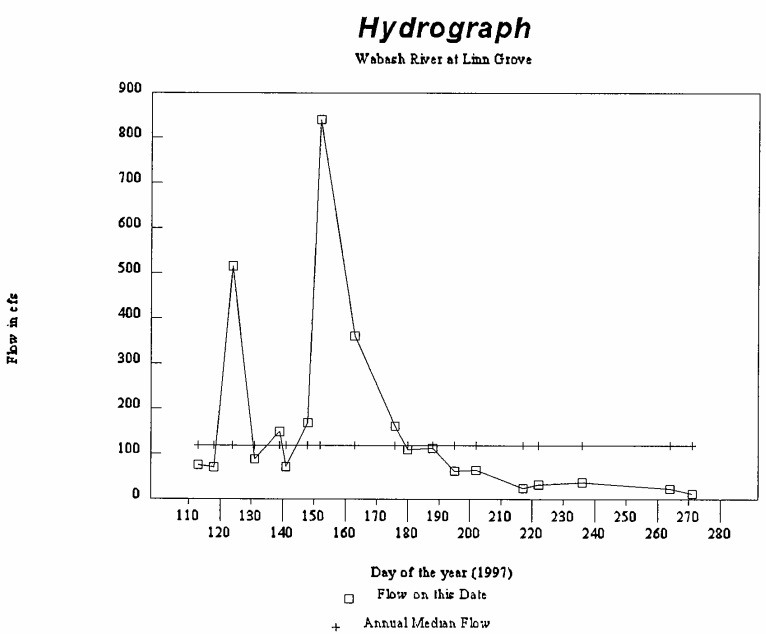
Improved conditions will be evident by a decrease in sediment-tolerant animals and an increase in the numbers and kinds of animals which require high water quality.

The Wabash River's water and habitat quality are impaired before the river enters Indiana. Cooperation with nonpoint source agencies in Ohio may be necessary to bring about significant improvements in water quality in the Adams County portion of the Wabash River.

INTRODUCTION

This is the second of two studies conducted to measure the "biological integrity" of the Upper Wabash River and its major tributaries in Adams County, Indiana. The first study was conducted in late 1996, in conjunction with volunteer chemical monitoring by teachers and students from South Adams High School. A second study was conducted to help determine how much water quality variability was present. Sampling for this study was initially planned for May 1997 during the crop planting season but a wet spring and summer (see the hydrograph below) prevented benthic sampling until autumn of 1997. Several sampling trips were rained out by flash floods.

The upper Wabash River has been identified by the Indiana Department of Environmental Management (IDEM) has as having degraded water quality due to nonpoint sources of pollution [1]. Soil conservation plans are being designed by the Adams County SWCD office to help reduce non-point source problems in the stream. Stream monitoring was planned to help determine where land treatments could be most beneficial to improving water quality, as measured by both aquatic communities and water chemistry.



Local Setting

The upper Wabash river is located in the "Eastern Corn Belt" ecoregion of the Central United States. [2]. This ecoregion is a till plain formed by glaciers. It has little geographic relief and its soils are typically rich in silt and silty clay loams. Originally, the watershed supported an extensive beech-maple-oak forest, but row crop agriculture and livestock grazing are the most common land uses today.

The Wabash River as it enters Adams County is a fourth order stream with a total drainage area of about 280 square miles [18]. It flows northwestward and several tributaries contribute to an additional 190 square miles of drainage area before it flows into adjoining Wells County. The largest tributary, Loblolly Creek, has a drainage area of 110 square miles.

Presently, only a few sections of the Wabash River in Adams County are artificially channelized and most areas retain their natural channel characteristics. Only about 5 to 10% of the watershed is wooded, with most of the remainder being used for agricultural purposes.

Sampling Sites

Six sites on the Wabash River and four sites on tributaries were chosen for sampling (Fig. 1 and 2). A summary of each site and its watershed area [18] is shown below:

REFERENCE SITE

Site 1	Stoney Creek at CR 500 N Randolph County	58 km^2	(23 mi^2)

TRIBUTARY SITES

Site 2	Brewster Ditch @ Hwy 116	15 km^2	(6 mi^2)
Site 3	Loblolly Creek @ Hwy 116	280 km^2	(110 mi^2)
Site 4	Limberlost Creek (Adams/Jay County Line)	105 km^2	(41 mi^2)
Site 5	Threemile Creek @ Linn Grove (River Road)	26 km^2	(10 mi^2)

WABASH RIVER SITES

Site 6	Wabash River @ New Corydon (CR 700 E)	730 km^2	(284 mi^2)
Site 7	Wabash River @ CR 125 E	750 km^2	(292 mi^2)
Site 8	Wabash River above Geneva (Hwy 116)	760 km^2	(296 mi^2)
Site 9	Wabash River below Geneva (Price Bridge)	1030 km^2	(404 mi^2)
Site 10	Wabash River @ Linn Grove (CR 700 S)	1150 km^2	(448 mi^2)
Site 11	Wabash River @ Vera Cruz (Adams/Wells County Line)	1190 km^2	(465 mi^2)

All water quality and aquatic community measurements reported here were collected on October 1, 1997.

Figure 1.

Generalized location of all sites.

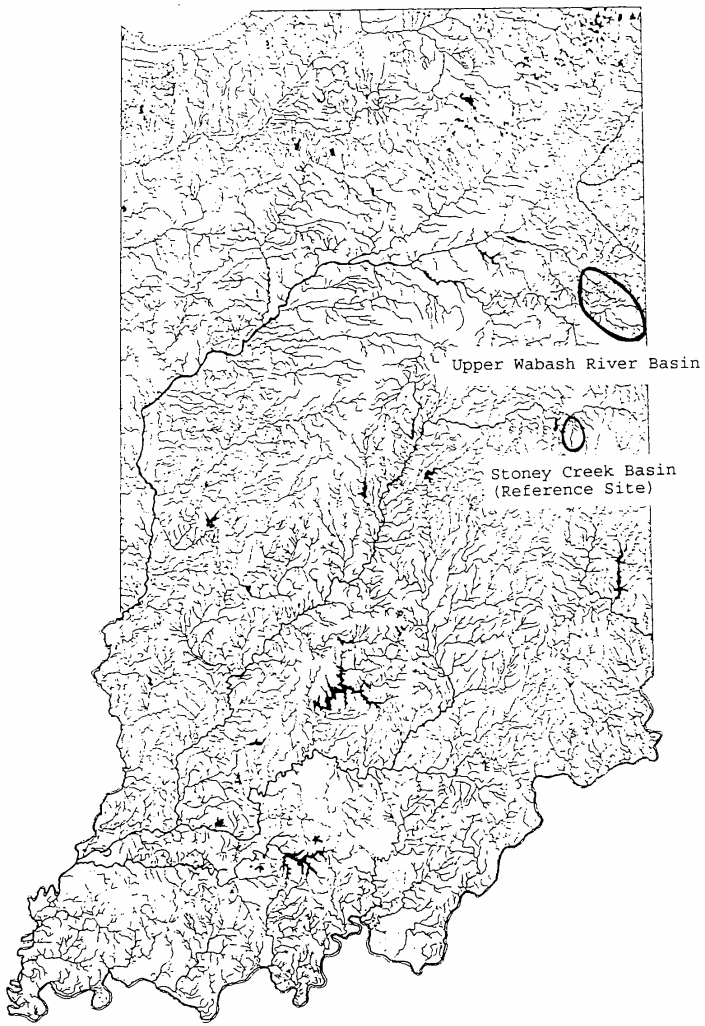
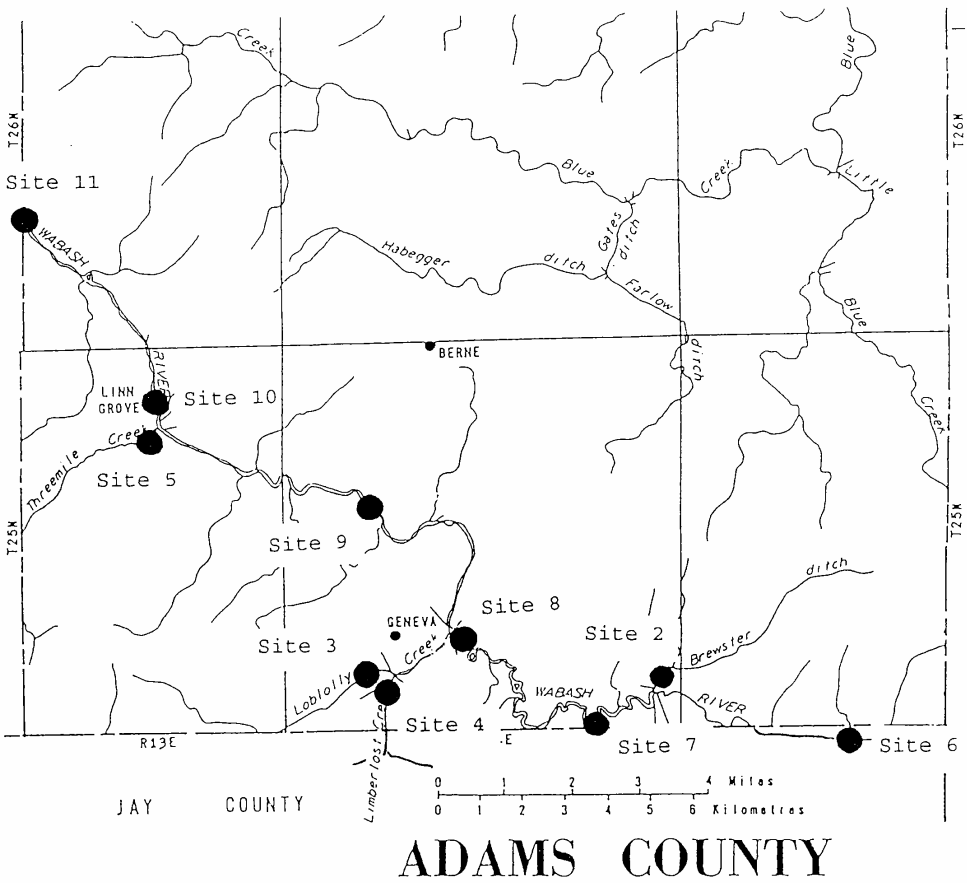


Figure 2.

Locations of study sites



METHODS

Because they are considered to be more sensitive to local conditions and respond relatively rapidly to environmental change [3], benthic (bottom-dwelling) organisms were used to document the biological condition of each stream. The U.S. Environmental Protection Agency (EPA) has recently developed a "rapid bioassessment" protocol [4] which has been shown to produce highly reproducible results that accurately reflect changes in water quality. We used EPA's Protocol III to conduct this study. Protocol IlI requires a standardized collection technique, a standardized subsampling technique, and identification of at least 100 animals from each site to the genus or species level from both "study sites" and a "reference site."

Reference Site

In the rapid bioassessment technique, the aquatic community of a reference site is compared to that of each study site to determine how much impact has occurred. The reference site should be in the same "ecoregion" as the study sites and be approximately the same size. It should be as pristine as possible, representing the best conditions possible for that area. Stoney Creek in Randolph County was chosen as the reference site for this study. Its watershed area at the selected study site is about 58 square kilometers (23 square miles), which is similar to those of the Wabash River tributaries. In addition, it is located less than 50 kilometers (30 miles) south of the study area and therefore is representative of local conditions. Stoney Creek is known to have excellent aquatic habitat and one of the highest "biotic index values" for fish and macroinvertebrate communities in central Indiana [5,6]. Therefore, its habitat and water quality are probably among the best available within this area.

Habitat Analysis

Habitat analysis was conducted according to Ohio EPA methods [20] during the previous water quality study [25]. In this technique, various characteristics of a stream and its watershed are assigned numeric values. All assigned values are added together to obtain a "Qualitative Habitat Evaluation Index." The highest value possible with this habitat assessment technique is 100.

Water Chemistry

Water chemistry measurements were made at each study site on the same day that macroinvertebrate samples were collected. Dissolved oxygen was measured by the membrane electrode method. The pH measurements were made with a Cole-Parmer pH probe. Conductivity was measured with a Hanna Instruments meter. Temperature was measured with a YSI dissolved oxygen/temperature meter. All instruments were calibrated in the field immediately prior to measurements.

Macroinvertebrate Sample Collection

Samples in this study were collected by kicknet from riffle habitat where current speed was 20-30 cm/sec. Riffles were used because they were the most important benthic habitat present at all study sites. The kicknet was placed immediately downstream from the riffle while the sampler used a hand to dislodge all attached benthic organisms from rocks upstream from the net. The organisms were swept by the current into the kicknet and subsequently transferred to a white pan. Each sample was examined in the field to assure that at least 100 organisms were collected at each site. All samples were preserved in the field with 70% ethanol.

Benthic samples were not collected from Brewster Ditch. The previous sampling effort [25] concluded that Brewster Ditch habitat is too low to support a benthic community representative of free-flowing conditions.

Laboratory Analysis

In the laboratory, a 100 organism subsample was prepared from each site by evenly distributing the whole sample in a white, gridded pan. Grids were randomly selected and all organisms within grids were removed until 100 organisms had been selected from the entire sample.

Each animal was identified to the lowest practical taxon (usually genus or species). As relatively rare taxa were identified (represented at fewer than 10% of most Indiana stream sites), a representative set of specimens was preserved as a "voucher." All voucher specimens will ultimately be deposited in the Purdue University Department of Entomology collection.

Data Analysis

The benthic data were used to calculate seven of the eight U.S. EPA metrics suggested in [4]. EPA's % shredder metric was not used because there was very little coarse particulate organic matter (CPOM) present at any site. Shredders (animals which eat coarse materials such as leaves by shredding them and beginning the breakdown process) require CPOM in the form of leaf packs. Last year's leaves had already been consumed and few new leaves had fallen by the sampling date. The Ohio EPA % mayfly metric was substituted. Sites with more than 25% mayflies were given a score of 6, sites with 10-25% mayflies scored a 4, sites with 1-10% mayflies get a 2 score, while sites with no mayflies present got 0 points for this metric.

RESULTS

Water Quality Measurements
October 1, 1997

	D.O. mg/l	pH SU	Cond. uS	Temp. (C)
REFERENCE STREAM				
Site 1 (Stoney Cr.) Time = 10:00 a.m.	8.5	8.5	500	15.5
TRIBUTARY STREAMS				
Site 2 (Brewster Ditch) Time = 5:30 p.m.	5.4	7.6	300	17.0
Site 3 (Loblolly Creek) Time = 3:20 p.m.	4.3	8.3	2200	18.0
Site 4 (Limberlost Cr.) Time = 2:40 p.m.	5.4	7.9	800	14.5
Site 5 (Threemile Cr.) Time = 1:20 p.m.	14.1	8.7	500	16.5
WABASH RIVER				
Site 6 (New Corydon) Time = 5:00 p.m.	7.8	8.1	700	15.0
Site 7 (CR 125 E) Time = 4:15 p.m.	9.4	8.2	700	15.0
Site 8 (above Geneva) Time = 3:45 p.m.	9.4	8.9	400	16.0
Site 9 (below Geneva) Time = 2:00 p.m.	7.3	8.0	1100	15.0
Site 10 (Linn Grove) Time = 12:50 p.m.	11.4	8.3	1200	16.5
Site 11 (Vera Cruz) Time = 12:10 p.m.	9.8	7.9	1000	14.5

D.O. = Dissolved Oxygen
Cond. = Conductivity
Temp. = Temperature in Degrees Centigrade

Mussel Observations

Live and freshly dead mussels were observed at several sites during this study. The most commonly observed species were Lampsilis siliquoidea and Amblema plicata, which were represented by live specimens. Freshly dead specimens of Strophitus undulatus, and Quadrula quadrula were observed as well. Weathered specimens of Lampsilis cardium, Anodonta grandis, and Anodontoides ferussacianus were present at one or more sites. None of these species are considered endangered or threatened.

Table 1.
Rapid Bioassessment Results - Reference & Tributaries
October 1997

	Site # 1	2	3	4	5
Chironomidae (Midges)					
Chironomus spp.			16		
Polypedilum convictum				6	1
Orthocladius obumbratus	1				2
Microtendipes caelum					1
Dicrotendipes nervosus			18		
Glyptotendipes lobiferus					
Cryptochironomus sp.			1		
Tanytarsus sp.				3	
Paratanytarsus sp.	1				
Thienemannymia gr.			6	13	1
Psectrocladius psilopterus					3
Simuliidae (Blackflies)	3				
Tipulidae (Craneflies)					
Tipula sp.	1		4		
Limnophila sp.	3				
Ephemeroptera (Mayflies)					
Isonychia sayi	6				
Stenonema terminatum					
S. integrum					
Baetis flavistriga	5			1	5
B. interclaris					
B. brunneicolor	2			15	5
Stenacron interpunctatum	1		12		2
Caenis latipennis			4		
Tricorythodes spp.	3				
Trichoptera (Caddisflies)					
Cheumatopsyche spp.	11		6	53	17
Hydropsyche betteni					25
H. simulans					
H. bidens					
H. orris					
Ceratopsyche bifida	9				
C. sparna				1	4
C. slossonae	13				
Helicopsyche borealis	1				
Coleoptera (Beetles)					
Stenelmis crenata	21			1	16
S. sexlineata					
S. humerus					11
Dubiraphia vittata					2

Table 1 (cont.)
Rapid Bioassessment Results

	Site # 1	2	3	4	5
Corixidae (Water Boatmen)					
Sigara spp.			23		
Odonata (Damselflies)					
Basiaeschna sp.				1	
Ischnura sp.			6	1	
Calopteryx sp.					1
Megaloptera (Alderflies)					
Sialis sp.			1		
Isopoda (Sowbugs)					
Lirceus spp.					1
Caecidotea spp.					
Cambaridae (Crayfish)				1	
Gastropoda (Snails)					
Elimia livescens	18				
Ferrissia sp.	1		1	3	
Physella gyrina					
Helisoma sp.					3
Pelecypoda (Clams)					
Sphaerium sp.				1	
Hirudinea (Leeches)			1		
Turbellaria (Planaria)					
Oligochaeta (Worms)					
Tubificidae			1		
Naididae					
Branchiura sowerbyi					
Total	100	*	100	100	100

Site 1 = Reference (Stoney Cr.)
Site 2 = Brewster Ditch (* benthos not sampled)
Site 3 = Loblolly Creek
Site 4 = Limberlost Creek
Site 5 = Threemile Creek

Table 2. Data Analysis

METRICS	Site # 1	2	3	4	5
# of Genera	16	*	14	12	15
Biotic Index	3.9	*	8.4	6.1	6.2
Scrapers/Filterers	1.0	*	2.3	0.1	0.7
EPT/Chironomids	45	*	0.5	3.2	7.2
% Dominant Taxon	21	*	(23)	53	25
EPT Index	8	*	3	3	5
Community Loss Index	0.0	*	0.9	0.9	0.7
% Mayflies	17	*	17	16	12

SCORING	Site # 1	2	3	4	5
# of Genera	6	*	6	4	6
Biotic Index	6	*	0	2	2
Scrapers/Filterers	6	*	6	0	6
EPT/Chironomids	6	*	0	0	2
% Dominant Taxon	4	*	4	0	4
EPT Index	6	*	0	0	4
Community Loss Index	6	*	4	4	4
% Mayflies	4	*	4	4	4
TOTAL	44	*	24	14	32
% of Reference	100	*	55	32	73
Impairment Category	N	*	S	M	S

N = NONE S = SLIGHT M = MODERATE * = NOT SAMPLED

Table 2.
Rapid Bioassessment Results - Wabash River Sites
October 1997

	Site #					
	6	7	8	9	10	11
Chironomidae (Midges)						
Chironomus spp.		1				
Microtendipes caelum						
Parachironomus frequens	2					
Eukiefferiella potthasti	2	1		1	1	
Dicrotendipes nervosus	5					
Orthocladius obumbratus		2				
Glyptotendipes lobiferus	26	2				1
Polypedilum convictum		3		2	2	
P. illinoense		1	2			1
Cryptochironomus fulvus	1		1			
Thienemannymia gr.						2
Simuliidae (Blackflies)						
Tipulidae (Craneflies)						
Tipula sp.				1		
Limnophila sp.						
Ephemeroptera (Mayflies)						
Isonychia sayi						
Baetis interclaris	6	3	2	2	6	3
B. flavistriga	3	3			2	
B. hageni		1			2	
Stenonema terminatum	1		1	4		6
S. integrum						3
Stenacron interpunctatum						
Tricorythodes sp.		1	1	1		1
Caenis latipennis						
Trichoptera (Caddisflies)						
Cheumatopsyche spp.	21	37	7	17	16	9
Hydropsyche betteni				1		1
H. bidens		4		1		5
H. simulans	1	8	8	4		5
H. orris	1	14	3	2		
H. valanis					2	2
Ceratopsyche bifida			1			3
C. sparna						1
Potamyia flava						11
Coleoptera (Beetles)						
Stenelmis crenata	8	6		18	28	10
S. sexlineata		6			10	3
S. humerus	17	2	15	43	16	26
Dubiraphia vittata						

Table 1 (cont.)
Rapid Bioassessment Results

	Site #					
	6	7	8	9	10	11
Corixidae (Water Boatmen)						
Sigara spp.						
Odonata (Damselflies)						
Argia apicalis		2				
Megaloptera (Alderflies)						
Sialis sp.				1		
Isopoda (Sowbugs)						
Lirceus spp.		1				
Caecidotea sp.				1		
Cambaridae (Crayfish)						
Gastropoda (Snails)						
Elimia livescens						
Ferrissia sp.	2					
Physella gyrina					1	
Peleycopoda (Clams)					2	1
Turbellaria (Planaria)		1			10	3
Oligochaeta (Worms)						
Tubificidae	4	1	5		1	2
Naididae				1		
Branchiura sowerbyi					1	1
Total	100	100	46	100	100	100

Site 6 = Wabash River at New Corydon
Site 7 = Wabash River between New Corydon and Geneva
Site 8 = Wabash River upstream from Geneva
Site 9 = Wabash River downstream from Geneva
Site 10 = Wabash River at Linn Grove
Site 11 = Wabash River at Vera Cruz

Table 2. Data Analysis

METRICS	Site # 6	7	8	9	10	11
# of Genera	12	14	10	12	11	15
Biotic Index	7.2	6.2	6.5	5.8	6.1	5.8
Scrapers/Filterers	1.2	0.2	0.8	2.6	2.8	1.3
EPT/Chironomids	0.9	7.3	7.8	11	9.3	12
% Dominant Taxon	25	37	33	61	53	39
EPT Index	4	6	5	4	3	7
Community Loss Index	1.2	0.8	1.0	0.9	1.2	0.7
% Mayflies	10	10	9	7	10	13

SCORING	Site # 6	7	8	9	10	11
# of Genera	4	6	4	4	4	6
Biotic Index	0	2	2	4	2	4
Scrapers/Filterers	6	2	6	6	6	6
EPT/Chironomids	0	4	4	6	6	6
% Dominant Taxon	4	2	2	0	0	2
EPT Index	2	2	4	4	0	6
Community Loss Index	2	4	2	4	2	4
% Mayflies	4	4	2	2	4	4
TOTAL	22	26	26	30	24	38
% of Reference	50	59	59	68	55	86
Impairment Category	M	S	S	S	S	N

N = NONE S = SLIGHT M = MODERATE Sv = SEVERE

DISCUSSION

Chemical parameters measured at each site indicate that dissolved oxygen, pH, temperature, and conductivity fell within acceptable ranges for most forms of aquatic life. There was a well-defined sag in dissolved oxygen concentrations between Sites 8 and 9 (upstream and downstream from Geneva on the Wabash River). The most common cause for dissolved oxygen sags such as this is an increase in biological oxygen demand or BOD. The Geneva Wastewater Treatment Plant lies between the two sites but other sources of BOD are possible as well. For example, relatively low D.O. was also measured in Loblolly Creek, which enters the Wabash between sites 8 and 9. TPI, a tomato packing company, has a wastewater discharge on Loblolly Creek which may have contributed to this sag.

Algae are important in determining the pH value of streams. During late autumn, the pH of most streams typically declines to less than 8.0, as algal growth decreases during the cooler weather. However, the pH values of many sites in this study were greater than 8.0, with the highest pH (8.7 to 8.9) occurring in Three Mile Creek and the Wabash River upstream from Geneva. These high pH values during cooler weather are often an indicator of nutrient enrichment. Higher nutrient inputs allow algae to grow abundantly. The high pH at Geneva (site 8) may have been due to other causes (see below).

A total of 47 macroinvertebrate genera were collected at the ten benthos sites. The most commonly collected invertebrates were caddisfly larvae (e.g. Cheumatopsyche and Hydropsyche) dominant at 4 sites, midge larvae (e.g. Dicrotendipes and Glyptotendipes) dominant at 2 sites, and riffle beetles (Stenelmis) dominant at 4 sites.

Table 2 shows how the aquatic communities at the study sites compared to that of the reference stream. The table shows that the biotic index values of the Wabash River increased from 22 at the most upstream site (site 6) to 38 at the most downstream sites (site 11). The uppermost site on the Wabash River would be considered "moderately impaired" while the next four downstream sites would be categorized as "slightly impaired." Site 11 at Vera Cruz would be judged as having no impairment.

Of the three Wabash River tributaries monitored, two fell in the slightly impaired category while one (Limberlost Creek) was moderately impaired.

Figure 3 shows the normal relationship of biotic index scores to habitat values (a linear relationship according to [4]). The figure also shows a range of plus or minus 10% to account for a certain amount of measurement variability. When biotic index values fall outside this range, the site typically has degraded water quality. Figure 3 indicates that seven of the nine study sites had biotic index values below those predicted by their habitat. Therefore, all these sites may be affected by degraded water quality as well as habitat loss. Two sites (Three Mile Creek and the Wabash River at Vera Cruz) may be supporting aquatic communities as good as their present habitat will allow.

An examination of those metrics showing the greatest difference from the reference stream may provide an important clue about causes of biological impairment. The largest differences at most of the study sites were (1) an increased abundance of "tolerant" groups, (2) a decline in the EPT index value (fewer kinds of "intolerant" animals), (3) increasing dominance by a single group, and (4) an increased presence of tolerant midge larvae.

The decline in the number and types of EPT organisms (those which are known to be especially sensitive to environmental changes) and an increased dominance by tolerant forms are signs of several kinds of environmental degradation. For example, some studies have shown this metric to be associated with instream toxicity [11]. However, changes in other metrics commonly indicating toxicity problems (e.g. a reduction in the number of taxa) were not observed and few "toxic indicator" organisms were observed at any site. A more likely explanation for this shift in the types of animals present is stress caused by stream sedimentation or nutrient enrichment, often associated with agricultural runoff. For example, changes favoring chironomids at the expense of EPT taxa have been observed in other studies [9].

Table 3 shows sediment-tolerance values for many of the commonly collected animals in these streams. Sediment and turbidity-tolerant forms were much more abundant at all study sites than in the reference site. These results indicate that excess sedimentation may be a primary water quality problem in the upper Wabash River watershed.

Figure 3.
Habitat vs. Biotic Index Scores

Sites falling outside the +10% range are probably affected by degraded water quality

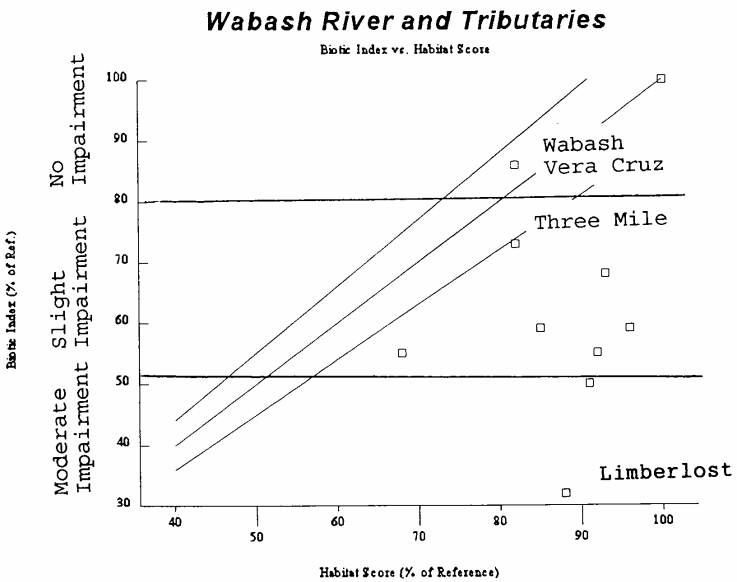


Table 3. Sediment-Tolerant Species Observed
(References shown in brackets)

Cheumatopsyche sp.	[10] [9]
Hydropsyche betteni	[9]
Stenacron interpunctatum	[10]
Baetis flavistriga	
Chironomus spp.	[7]
Orthocladius spp.	[10] [16]
Thienemannymia group	[10]
Tubificidae	[12]

% of Sediment-Tolerant Organisms at the Reference Site 1		21%
% of Sediment-Tolerant Organisms at the Study Sites		
	Site 3	26%
	Site 4	74%
	Site 5	54%
	Site 6	60%
	Site 7	55%
	Site 8	15%
	Site 9	24%
	Site 10	28%
	Site 11	20%

Sediment-Intolerant Species Observed

Tipula sp.	[10]
Microtendipes caelum	[10]
Ceratopsyche sp.	[8]
Helicopsyche borealis	[10]

% of Sediment-Intolerant Organisms at the Reference Site 1		27%
% of Sediment-Intolerant Organisms at the Study Sites		
	Site 3	2%
	Site 4	1%
	Site 5	5%
	Site 6	0%
	Site 7	0%
	Site 8	1%
	Site 9	1%
	Site 10	0%
	Site 11	4%

An obvious on-going source of excessive sediment input was observed at Geneva. A gravel quarry (Limberlost Sand and Gravel) immediately upstream from the sampling site on Highway 116 was discharging high volumes of sediment from quarrying operations into a small tributary. Sediment from this tributary covered every available substrate in the Wabash River for several hundred yards downstream. The number of benthic macroinvertebrates at this site was drastically reduced but, surprisingly, the biotic index value was not seriously affected. No record of an NPDES discharge permit for this quarry was found in Indiana Department of Environmental Management files. IDEM should pursue immediate enforcement action to halt this unnecessary discharge of sediment to the Wabash River.

It is interesting to note that the Hilsenhoff Biotic Index (HBI) metric, which is highly sensitive to reductions in dissolved oxygen [17], was also higher at all study sites than at the reference stream. This may indicate that, in addition to sedimentation, a significant source of oxygen-demanding pollutants is also contributing to the water quality degradation observed in the upper Wabash River watershed. Measured D.O. at all sites were well within acceptable concentrations, but D.O. could be much lower on occasion. Often, this occurs if nutrient enrichment causes algae blooms. Algae blooms can cause huge swings in dissolved oxygen of streams, with large amounts during the day and very low levels at night or following a succession of cloudy days.

In summary, sediment accumulation and nutrient enrichment appear to be the most likely cause of water quality impairment in the upper Wabash River watershed. Additional impairment may be due to periodically low dissolved oxygen concentrations, either associated with algae blooms or from an unknown oxygen-demanding pollutant.

COMPARISON TO OTHER STUDIES

An identical study conducted in 1996 showed almost the same degree of impairment observed here [25]. One site (Limberlost Creek) had reduced water quality during 1997 while another site (Wabash River at Vera Cruz) had better water quality.

The benthic macroinvertebrate community of the upper Wabash River was studied between 1978 and 1980 at a site in nearby Wells County [22]. The author found that the upper Wabash had nutrient concentrations (nitrates and phosphorus) above the median level for Indiana streams and that the benthos was usually dominated by Scraper organisms capable of eating periphyton stimulated by nutrients. Pollution intolerant animals were present during some years but not others. Unpublished data for this same site during subsequent years [23] show that the benthic community is highly variable from year to year. The number of EPT taxa has been noticeably low, and the benthic community has often been dominated by one or two tolerant organisms. Sediment tolerant animals such as Cheumatopsyche spp., Stenacron interpunctatum, and Glypotendipes spp. were often dominant, further supporting the observation that sediment deposition has been a long-term problem in the upper Wabash.

Despite the impaired aquatic community, there appears to be a fairly diverse mussel community in the upper Wabash River. As many as eight species were observed alive or recently dead in a 1984 collection from the Bluffton, Indiana area [24].

There are no recently published data on fish collections from the upper Wabash River Basin. Gerking [19] collected fish from Limberlost Creek during 1941. This tributary of the Wabash River in Adams County supported at least 26 species of fish, which is a remarkably high degree of diversity for one collecting site in a small stream (see Appendix for collection data). Included among the fish he collected were several species (brindled madtom, longear sunfish) considered to be intolerant of degraded environmental conditions [4]. This information suggests that environmental conditions in the watershed may have been somewhat better in the 1940's than they are today.

Ohio EPA published a water quality study of the St. Marys River in Ohio in 1992 [26]. This watershed is immediately north of the Wabash River and is also drained by Grand Lake St. Marys. Therefore, these two waterbodies should have many of the same biological and geographic characteristics. Ohio EPA found that the St. Marys River suffered from excessive sediment and nutrient inputs at most sites, just as the Wabash River does as it enters Adams County. The St. Marys River was also dominated by fish and macroinvertebrates tolerant to these conditions.

Ohio EPA has also recently made available an assessment of the Upper Wabash River and its tributaries in Ohio [27]. Ohio EPA considers the Wabash River from Beaver Creek to the State Line as not attaining its designated uses for aquatic life due to habitat alterations, siltation, and organic enrichment. Both point and nonpoint sources of pollution are cited as sources of this impairment.

RECOMMENDATIONS

1. Monitor these sites again in three to five years using the same biological assessment techniques. This information will be very useful in determining whether water quality has improved or declined after initiation of Best Management Practices in the watershed.

2. Work toward continued protection of the vegetative buffer zone along the stream corridors. It would be helpful to restore severely eroding banks near site 7 at CR 125 E.

3. Discourage channelization of each stream. Minimizing channelization allows the streams to retain a natural channel that enhances aquatic habitat.

4. Discourage direct access to streams by livestock. Large numbers of livestock can trample stream banks, decreasing the ability of streamside vegetation to filter out pollutants and hastening erosion.

5. Evaluate land use to identify significant contributors of nonpoint source pollutants such as livestock waste and eroded soil within the watershed.

6. Improved conditions in the upper Wabash River watershed will be associated with the following changes in the benthic community:

    a. An increase in the kinds of "EPT" animals, especially Stenonema vicarium, Ceratopsyche bifida, Chimarra obscura, and stoneflies. These will make up more than 50% of the benthic community. At least six different EPT genera will be present.

    b. A decrease in the proportion of "midges" (below 25% of the benthic community). This is especially critical for the Loblolly Creek site.

    c. A decrease in "sediment-tolerant" animals such as the midges Chironomus and Glyptotendipes, mayflies such as Stenacron and caddisflies such as Cheumatopsyche. At the same time, there will be increases in sediment-intolerant animals, which should make up at least 10% of the benthic community.

    d. An increase in the percentage of mayflies. These should make up at least 25% of the aquatic community.

7. Establish contacts with nonpoint source agencies in Ohio to explore ways NPS control programs can be coordinated in the upper Wabash River Basin.

8. Work with the Indiana Department of Environmental Management and a local quarry to reduce or eliminate excessive sediment input to the Wabash River in the Geneva area.

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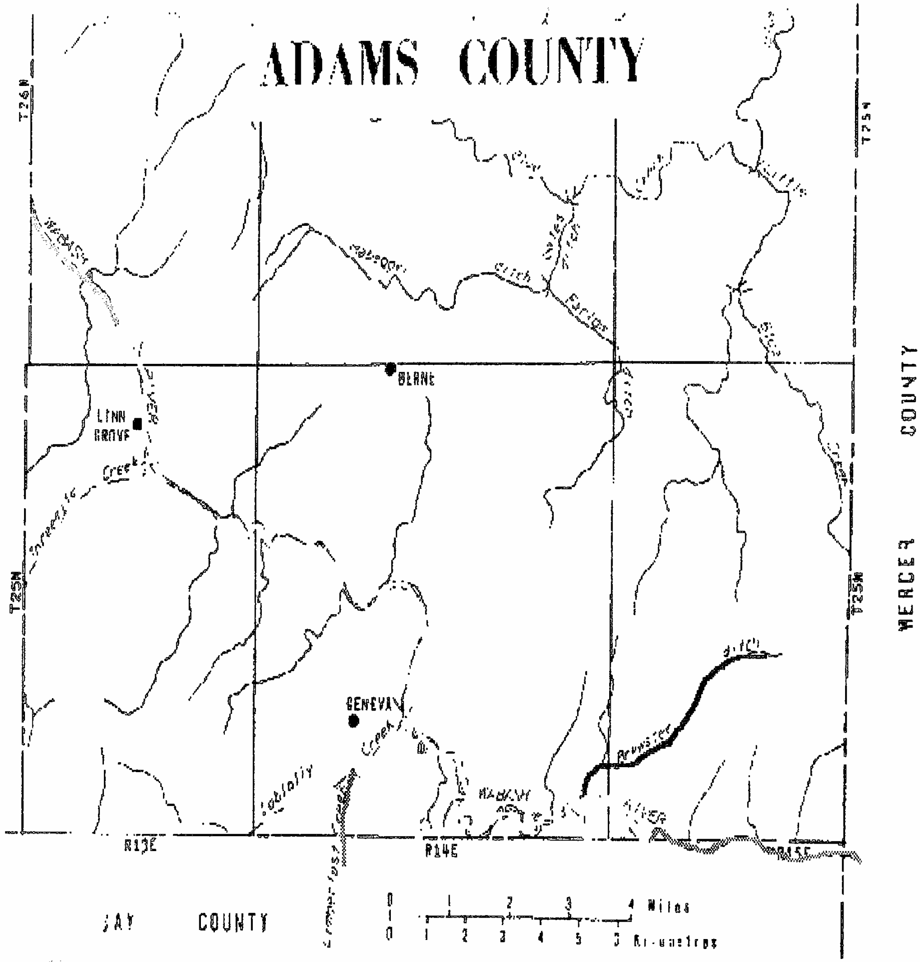


No Impairment Slight Impairment Moderate Impairment Severe Impairment

HABITAT SCORES FOR EACH SITE
Reference Site and Tributaries

	Site No. 1	2	3	4	5
Substrate (15%)	10	4	4	8	11
Instream Cover (15%)	10	1	3	10	6
Channel Morphology (15%)	12	4	7	8	10
Riparian Zone & Bank Erosion (15%)	10	5	13	9	12
Pool/Riffle Quality (15%)	13	1	5	12	9
Gradient (10%)	10	4	6	8	6
Drainage Area (15%)	9	7	12	10	7
TOTAL SCORE	74	26	50	65	61

Wabash River Sites

	Site No. 6	7	8	9	10	11
Substrate (15%)	10	8	8	8	10	6
Instream Cover (15%)	9	9	9	9	9	9
Channel Morphology (15%)	11	11	9	11	11	11
Riparian Zone & Bank Erosion (15%)	7	13	8	13	8	8
Pool/Riffle Quality (15%)	13	13	12	10	12	9
Gradient (10%)	4	4	4	4	4	4
Drainage Area (15%)	13	13	13	14	14	14
TOTAL SCORE	67	71	63	69	68	61

MACROINVERTEBRATE DATA SHEET

Type of Sampler [illegible]
Collection Depth
Substrate Type [illegible]
Remarks

Sample No. 1
Date [illegible]
Location
Stoney Creek

Station # Reference Site
Identification by CRR
Collector CRS

Enter Family and/or Genus and Species Name on Blank Line.

Organisms	No.	A.	I.
Diptera			
Chironomidae	[illegible]		
Orthocladius obumbratus	1		
Paratanytarsus sp.	1		
Simuliidae	3		
Other Tipula spp	1		
Limnophila spp.	3		
Trichoptera Potamyia flava			
Chimarrhopsyche spp	11		
Hydropsyche simulans			
H. cirris			
H. bidens			
H. betteni			
Cheumatopsyche spp	9		
Plecoptera C. sparna			
C. slossonae	13		
Helicopsyche borealis	1		
Isonychia sicca	6		
Ephemeroptera Caenis latipennis			
Tricorythodes spp.	3		
Baetis intercalaris			
B. flavistriga	5		
B. brunneicolor	2		
Stenacron interpunctatum	1		
Stenonema terminatum			
S. integrum			
Odonata Argia sp			
Ischnura sp			
Basiaeschna sp.			
Calopteryx sp.			
Hemiptera			
Corixa spp.			

	No.	A.	I.
Coleoptera Stenelmis crenata	11		
Stenelmis sexlineata			
S. bicarinata			
S. crenata	10		
Dubiraphia vittata			
Neuroptera and Megaloptera			
Sialis spp.			
Crustacea			
Liricus spp			
Caecidotea spp.			
Orconectes spp.			
Oligochaeta			
Tubificidae			
Naididae			
Branchiura sowerbyi			
Hirudinea			
Species A			
Bivalvia			
Sphaerium spp.			
Gastropoda			
Physa spp.			
Ferrissia spp.	1		
Helisoma spp			
Elimia ~~spp~~ livescens	18		
Bryozoa			
Coelenterata			
Other Turbellaria			

A = Adult, I = Immature
Total No. Organisms 100

Total No. ~~Taxa~~ Genera 16

HBI = 3.9
EPT = 42/42

MACROINVERTEBRATE DATA SHEET

Type of Sampler: D-net
Collection Depth:
Substrate Type: riffle
Remarks: duplicate

Identification by: GRB

Sample No.: 1
Date: 10/1/97
Location: Stoney Creek

Station #: Reference Site
Collector: GRB

Enter Family and/or Genus and Species Name on Blank Line.

Organisms	No.	A.	I.
Diptera			
Chironomidae	4		
Orthocladius? obumbratus	1		
Simuliidae	3		
Other Tipula spp.	1		
Limnophila spp.	2		
Trichoptera Potamyia flava			
Cheumatopsyche spp.	6		
Hydropsyche simulans			
H. orris			
H. bidens			
~~H. bettini~~ Neotricha spp.	1		
Ceratopsyche bifida	9		
Plecoptera C sparna			
C. slossonae	11		
Helicopsyche borealis	1		
Isonychia sicca	4		
Ephemeroptera Caenis latipennis			
Tricorythades spp.	3		
Baetis intercalaris			
B. flavistriga	5		
B. ~~bragai~~ bruneicolor	4		
Stenacron interpunctatum	1		
Stenonema terminatum			
S. integrum			
Odonata Argia sp.			
Ischnura sp.			
Basiaeschna sp.			
Calopteryx sp.			
Hemiptera			
Corixa spp.			

	No.	A.	I.
Coleoptera Stenelmis larvae	12		
Stenelmis sexlineata			
S. humerus			
S. crenata	14		
Dubiraphia vittata			
Neuroptera and Megaloptera			
Sialis spp.			
Crustacea			
Lirceus spp.			
Caecidotea spp.			
Orconectes spp.			
Oligochaeta			
Tubificidae			
Naididae			
Branchiura sowerbyi			
Hirudinea			
Species A			
Bivalvia			
Sphaerium spp.			
Gastropoda			
Physa spp.			
Ferrissia spp.	1		
Helisoma spp.			
Elimia ~~spp~~ tenesseens	21		
Bryozoa			
Coelenterata			
Other			
Turbellaria			

A = Adult, I = Immature

Total No. Organisms: 100

Total No. ~~Taxa~~ Genera: 15

HBI = 3.8
SIF = 50/34

MACROINVERTEBRATE DATA SHEET

Type of Sampler: D-net
Collection Depth:
Substrate Type: riffle
Remarks:

Sample No.:
Date: 10/4/97
Location: Loblolly Creek
Station #:
Collector: GRB

Identification by: GRB

Enter Family and/or Genus and Species Name on Blank Line.

Organisms	No.	A.	I.
Diptera			
Chironomidae			
Diceratodiplex nervosus	4		
Chironomus sp.	8		
Thienemanniella gpup	3		
Cryptochironomus sp.	1		
Other Tipula spp.	2		
Trichoptera Potamyia flava			
Cheumatopsyche spp.	3		
Hydropsyche simulans			
H. orris			
H. bidens			
H. betteni			
Ceratopsyche bifida			
Plecoptera C sparna			
Ephemeroptera Caenis latipennis	2		
Tricorythodes spp.			
Baetis intercalaris			
B. flavistriga			
B. hagani			
Stenacron interpunctatum	6		
Stenonema terminatum			
S. integrum			
Odonata Argia sp.			
Ischnura sp.	3		
Basiaeschna sp.			
Calopteryx sp.			
Hemiptera			
Corixa spp.	12		

	No.	A.	I.
Coleoptera Stenelmis larvae			
Stenelmis sexlineata			
S. humerus			
S. crenata			
Dubiraphia vittata			
Neuroptera and Megaloptera			
Sialis spp.	1		
Crustacea			
Lirceus spp.			
Caecidotea spp.			
Orconectes spp.			
Oligochaeta			
Tubificidae	1		
Naididae			
Branchiura sowerbyi			
Hirudinea			
Species A	1		
Bivalvia			
Sphaerium spp.			
Gastropoda			
Physa spp.			
Ferrissia spp.	1		
Helisoma spp.			
Bryozoa			
Coelenterata			
Other			
Turbellaria			

A = Adult, I = Immature

Total No. Organisms: 53

Total No. ~~Taxa~~ Genera: 14

HBI = 8.4
S/F = 7/3
FT = 2/21.

MACROINVERTEBRATE DATA SHEET

Type of Sampler: D-net
Collection Depth:
Substrate Type: riffle
Remarks:

Sample No.: 4
Date: 10/1/97
Location: Limberlost Creek
Station #:
Collector: GRB

Identification by: GRB

Enter Family and/or Genus and Species Name on Blank Line.

Organisms	No.	A.	I.
Diptera			
Chironomidae			
Thienemanniella gr.	13		
Tanytarsus sp	3		
Other Tipula spp.			
Trichoptera Potamyia flava			
Cheumatopsyche spp.	53		
Hydropsyche simulans			
H. orris			
H. bidens			
H. betteni			
Ceratopsyche bifida			
Plecoptera C sparna	1		
Ephemeroptera Caenis latipennis			
Tricorythodes spp.			
Baetis intercalaris			
B. flavistriga	1		
B. brunneicolor	15		
Stenacron interpunctatum			
Stenonema terminatum			
S. integrum			
Odonata Argia sp.			
Ischnura sp.	1		
Basiaeschna sp.	1		
Calopteryx sp.			
Hemiptera			
Corixa spp.			

	No.	A.	I.
Coleoptera Stenelmis larvae	1		
Stenelmis sexlineata			
S. humerus			
S. crenata			
Dubiraphia vittata			
Neuroptera and Megaloptera			
Sialis spp.			
Crustacea			
Lirceus spp.			
Caecidotea spp.			
Orconectes spp.	1		
Oligochaeta			
Tubificidae			
Naididae			
Branchiura sowerbyi			
Hirudinea			
Species A			
Bivalvia			
Sphaerium spp.	1		
Gastropoda			
Physa spp.			
Ferrissia spp.	3		
Helisoma spp.			
Bryozoa			
Coelenterata			
Other			
Turbellaria			

A = Adult, I = Immature

Total No. Organisms: 100

Total No. ~~Taxa~~ Genera: 12

HBI = 6.1

SIF = 4/55

MACROINVERTEBRATE DATA SHEET

Type of Sampler D-net
Collection Depth
Substrate Type riffle
Remarks ~~duplicate~~

Sample No. X 5
Date 10/1/97
Location Three Mile Creek
Station #
Identification by GRB
Collector GRB

Enter Family and/or Genus and Species Name on Blank Line.

Organisms	No.	A.	I.
Diptera			
Chironomidae			
Pseudochladius pilipennis	3		
Orthocladius dh. fluvius	2		
Microtendipes caelum	1		
Thienemanniella group	1		
Polypedilum convictum	1		
Other Tipula spp.			
Trichoptera Potamyia flava			
Cheumatopsyche spp.	17		
Hydropsyche simulans			
H. orris			
H. bidens			
H. betteni	25		
Ceratopsyche bifida			
Plecoptera C sparna	4		
Ephemeroptera Caenis latipennis			
Tricorythodes spp.			
Baetis intercalaris			
B. flavistriga	5		
B. ~~bicaudatus~~ tricaudatus	5		
Stenacron interpunctatum	2		
Stenonema terminatum			
S. integrum			
Odonata Argia sp.			
Ischnura sp.			
Basiaeschna sp.			
Calopteryx sp.	1		
Hemiptera			
Corixa spp.			

	No.	A.	I.
Coleoptera Stenelmis larvae	17		
Stenelmis sexlineata			
S. humerus	4		
S. crenata	6		
Dubiraphia vittata	2		
Neuroptera and Megaloptera			
Sialis spp.			
Crustacea			
Lirceus spp.	1		
Caecidotea spp.			
Orconectes spp.			
Oligochaeta			
Tubificidae			
Naididae			
Branchiura sowerbyi			
Hirudinea			
Species A			
Bivalvia			
Sphaerium spp.			
Gastropoda			
Physa spp.			
Ferrissia spp.			
Helisoma spp.	3		
Bryozoa			
Coelenterata			
Other			
Turbellaria			

A = Adult, I = Immature
Total No. Organisms 100

Total No. ~~Taxa~~ Genera 15

HBI = 6.2
S/F = 32/46

MACROINVERTEBRATE DATA SHEET

Type of Sampler D-net
Collection Depth
Substrate Type riffle
Remarks

Sample No.
Date 10/1/97
Location [illegible] River
[illegible]
Station #
Identification by GRB
Collector GRB

Enter Family and/or Genus and Species Name on Blank Line.

Organisms	No.	A.	I.
Diptera			
Chironomidae			
Glyptotendipes spp.	26		
Dicrotendipes spp	5		
Cryptochironomus spp	1		
Eukiefferiella pitthensis	2		
Parachironomus tregomus	2		
Other Tipula spp.			
Trichoptera Potamyia flava			
Cheumatopsyche spp.	21		
Hydropsyche simulans	1		
H. orris	1		
H. bidens			
H. betteni			
Ceratopsyche bifida			
Plecoptera			
Ephemeroptera			
Tricorythodes spp.			
Baetis intercalaris	4		
B. flavistriga	3		
B. hageni			
Stenacron interpunctatum			
Stenonema terminatum	1		
S. integrum			
Odonata Argia sp.			
Hemiptera			

Organisms	No.	A.	I.
Coleoptera Stenelmis larvae	22		
Stenelmis sexlineata			
S. humerus	2		
S. crenata	1		
Neuroptera and Megaloptera			
Sialis spp.			
Crustacea			
Lirceus spp.			
Caecidotea spp.			
Oligochaeta			
Tubificidae	4		
Naididae			
Branchiura sowerbyi			
Hirudinea			
Bivalvia			
Sphaeriin spp.			
Gastropoda			
Physa spp.			
Ferrissia spp.	2		
Bryozoa			
Coelenterata			
Other			
Turbellaria			

A = Adult. I = Immature
Total No. Organisms 100

Total No. Genera Taxa 12

HBI = 7.2
S/F = 28/23

MACROINVERTEBRATE DATA SHEET

Type of Sampler: D-net
Collection Depth:
Substrate Type: riffle
Remarks:

Sample No.: 7
Date: 10/1/97
Location: Wabash River CR 125 E
Station #: 7
Collector: GRB

Identification by: GRB
Enter Family and/or Genus and Species Name on Blank Line.

Organisms	No.	A.	I.
Diptera			
Chironomidae			
Polypedilum convictum	3		
P. illinoense	1		
Chironomus sp	1		
Glyptotend pic sp	2		
Eukiefferiella pitthuti	1		
Orthocladius obumbratus	2		
Other Tipula spp.			
Trichoptera Potamyia flava			
Cheumatopsyche spp.	33		
Hydropsyche simulans	8		
H. orris	14		
H. bidens	4		
H. betteni			
Ceratopsyche bifida			
Plecoptera			
Ephemeroptera			
Tricorythodes spp.	1		
Baetis intercalaris	3		
B. flavistriga	3		
B. hageni	1		
Stenacron interpunctatum			
Stenonema terminatum			
S. integrum			
Odonata Argia sp.	2		
Hemiptera			

	No.	A.	I.
Coleoptera Stenelmis larvae	7		
Stenelmis sexlineata	3		
S. humerus	1		
S. crenata	3		
Neuroptera and Megaloptera			
Sialis spp.			
Crustacea			
Lirceus spp.	1		
Caecidotea spp.			
Oligochaeta			
Tubificidae	1		
Naididae			
Branchiura sowerbyi			
Hirudinea			
Bivalvia			
Sphaerium spp.			
Gastropoda			
Physa spp.			
Ferrissia spp.			
Bryozoa			
Coelenterata			
Other			
Turbellaria	1		

A = Adult, I = Immature
Total No. Organisms: 100

Total No. ~~Taxa~~ Genera: 14

MBI = 6.2
SIF = 14/63

MACROINVERTEBRATE DATA SHEET

Type of Sampler: D-net
Collection Depth:
Substrate Type: riffle
Remarks:

Sample No.: 8
Date: 10/1/97
Location: Wabash River U/S Geneva
Station #: 8
Collector: GRB

Identification by: GRB

Enter Family and/or Genus and Species Name on Blank Line.

Organisms	No.	A.	I.
Diptera			
Chironomidae			
Cryptochironomus fulvus	1		
Polypedilum illinoense	2		
Other Tipula spp.			
Trichoptera Potamyia flava			
Cheumatopsyche spp.	7		
Hydropsyche simulans	8		
H. orris	3		
H. bidens			
H. betteni			
Ceratopsyche bifida	1		
Plecoptera			
Ephemeroptera			
Tricorythodes spp.	1		
Baetis intercalaris	2		
B. flavistriga			
B. hageni			
Stenacron interpunctatum			
Stenonema terminatum	1		
S. integrum			
Odonata Argia sp.			
Hemiptera			

	No.	A.	I.
Coleoptera Stenelmis larvae	4		
Stenelmis sexlineata			
S. humerus	11		
S. crenata			
Neuroptera and Megaloptera			
Sialis spp.			
Crustacea			
Lirceus spp.			
Caecidotea spp.			
Oligochaeta			
Tubificidae	5		
Naididae			
Branchiura sowerbyi			
Hirudinea			
Bivalvia			
Sphaeriin spp.			
Gastropoda			
Physa spp.			
Ferrissia spp.			
Bryozoa			
Coelenterata			
Other			
Turbellaria			

A = Adult, I = Immature
Total No. Organisms: 46

Total No. ~~Taxa~~ Genera: 10

Only 46 individuals could be collected with an intensive effort.

HBI = 6.5
SIF = 16/19
-IT- 1/15

MACROINVERTEBRATE DATA SHEET

Type of Sampler: D-net
Collection Depth:
Substrate Type: riffle
Remarks:

Sample No.: 9
Date: 10/1/97
Location: Wabash River D/S Geneva
Station #: 9
Identification by: GRB
Collector: GRB

Enter Family and/or Genus and Species Name on Blank Line.

Organisms	No.	A.	I.
Diptera			
Chironomidae			
Polypedilum convictum	2		
Eukiefferiella pithuti	1		
Other Tipula spp.	1		
Trichoptera Potamyia flava			
Cheumatopsyche spp.	17		
Hydropsyche simulans	4		
H. orris	2		
H. bidens	1		
H. betteni	1		
Ceratopsyche bifida			
Plecoptera			
Ephemeroptera			
Tricorythodes spp.	1		
Baetis intercalaris	2		
B. flavistriga			
B. hageni			
Stenacron interpunctatum			
Stenonema terminatum	4		
S. integrum			
Odonata Argia sp.			
Hemiptera			
Coleoptera Stenelmis larvae	43		
Stenelmis sexlineata			
S. humerus	13		
S. crenata	5		
Neuroptera and Megaloptera			
Sialis spp.	1		
Crustacea			
Lirceus spp.			
Caecidotea spp.	1		
Oligochaeta			
Tubificidae			
Naididae	1		
Branchiura sowerbyi			
Hirudinea			
Bivalvia			
Sphaerium spp.			
Gastropoda			
Physa spp.			
Ferrissia spp.			
Bryozoa			
Coelenterata			
Other			
Turbellaria			

A = Adult, I = Immature

Total No. Organisms: 100

Total No. ~~Taxa~~ Genera: 12

HBI = 5.8
S/F = 65/25

MACROINVERTEBRATE DATA SHEET

Type of Sampler: D-net
Collection Depth:
Substrate Type: riffle
Remarks:

Sample No.: ~~0~~ 10
Date: 10/1/97
Location: Wabash River, Linn Grove
Station #: ~~0~~ 10
Collector: GRB

Identification by: GRB

Enter Family and/or Genus and Species Name on Blank Line.

Organisms	No.	A.	I.
Diptera			
Chironomidae			
Polypedilum convictum	2		
Eukiefferiella potthasti	1		
Other Tipula spp.			
Trichoptera Potamyia flava			
Cheumatopsyche spp.	16		
Hydropsyche simulans			
H. ~~orris~~ valanis	2		
H. bidens			
H. betteni			
Ceratopsyche bifida			
Plecoptera			
Ephemeroptera			
Tricorythodes spp.			
Baetis intercalaris	6		
B. flavistriga	2		
B. hagani	2		
Stenacron interpunctatum			
Stenonema terminatum			
S. integrum			
Odonata Argia sp.			
Hemiptera			

	No.	A.	I.
Coleoptera Stenelmis larvae	26		
Stenelmis sexlineata	4		
S. humerus	9		
S. crenata	15		
Neuroptera and Megaloptera			
Sialis spp.			
Crustacea			
Lirceus spp.			
Caecidotea spp.			
Oligochaeta			
Tubificidae	1		
Naididae			
Branchiura sowerbyi	1		
Hirudinea			
Bivalvia			
Sphaerium spp.	2		
Gastropoda			
Physa spp.	1		
Ferrissia spp.			
Bryozoa			
Coelenterata			
Other			
Turbellaria	10		

A = Adult, I = Immature
Total No. Organisms: 100

Total No. ~~Taxa~~ Genera: 11

HBI = 6.1
S/F = 5-5/20

MACROINVERTEBRATE DATA SHEET

Type of Sampler: D-net
Collection Depth:
Substrate Type: riffle
Remarks:

Sample No.: 11
Date: 10/1/97
Location: Wahalia River, Vera Cruz
Station #:
Identification by: GRB
Collector: GRB

Enter Family and/or Genus and Species Name on Blank Line.

Organisms	No.	A.	I.
Diptera			
Chironomidae			
Thienemanniyia gr. sp.	2		
Glyptotendipes sp.	1		
Polypedilum illinoense	1		
Other Tipula spp.			
Trichoptera Potamyia flava	11		
Cheumatopsyche spp.	9		
Hydropsyche simulans	5		
H. ~~oers~~ valanis	2		
H. bidens	5		
H. betteni	1		
Ceratopsyche bifida	3		
Plecoptera C. sparna	1		
Ephemeroptera			
Tricorythodes spp.	1		
Baetis intercalaris	3		
B. flavistriga			
B. hageni			
Stenacron interpunctatum			
Stenonema terminatum	6		
S. integrum	3		
Odonata Argia sp.			
Hemiptera			

	No.	A.	I.
Coleoptera Stenelmis larvae	11		
Stenelmis sexlineata	2		
S. humerus	20		
S. crenata	6		
Neuroptera and Megaloptera			
Sialis spp.			
Crustacea			
Lirceus spp.			
Caecidotea spp.			
Oligochaeta			
Tubificidae	2		
Naididae			
Branchiura sowerbyi	1		
Hirudinea			
Bivalvia			
Sphaerium spp.	1		
Gastropoda			
Physa spp.			
Ferrissia spp.			
Bryozoa			
Coelenterata			
Other			
Turbellaria	3		

A = Adult, I = Immature

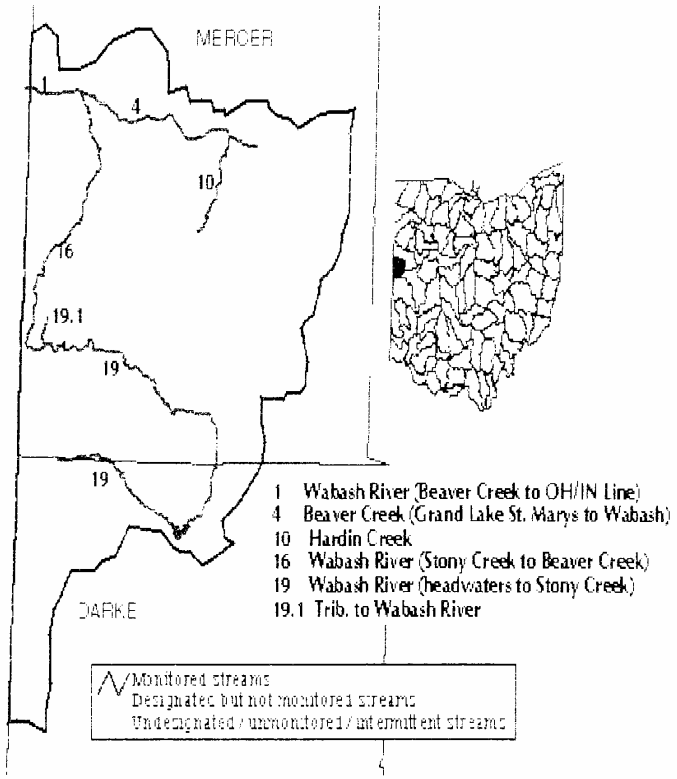
Total No. Organisms: 100

Total No. ~~Taxa~~ Genera: 15

HBI = 5.8
S/F = 48/38

Group 63 Wabash River Map of Hydrologic Group

Stream Network, Monitored Stream Segments and the Drainage Area for Group 63



What is use attainment? What are water quality standards? View Use Attainment Statistics View Causes and Sources of Impairment Download Water Quality Report(s)

Back to Home Page

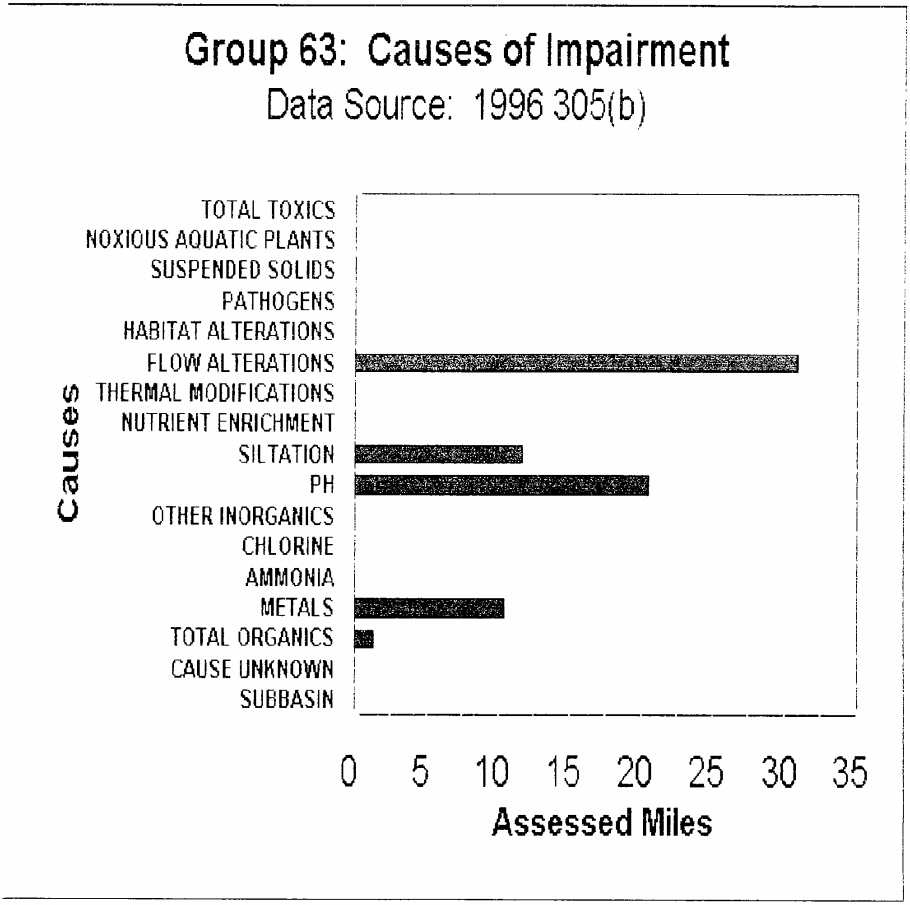
Last modified: October 31, 1997 " coords="6,1,93,86" href=".. whatisus.htm" " coords="7,89,84,160" href=".. wqstand.htm" " coords="8,170,85,240" href=".. attain use63.htm" " coords="9,249,85,320" href=".. attain cands63.htm"

Group 63 **Wabash River** **Use Impairment Summary**

Causes of impairment tell us why a stream is not attaining its use designation. The sources of these causes are generally grouped into two categories: point source pollutants and nonpoint source pollutants. The causes of impairments listed below are for those stream segments in the watershed that have been assessed and reported in the *1996 Ohio Water Resource Inventory (305(b) report).*

Please note: A stream mile may be impaired by more than one cause.

Total Designated Stream Miles:	151
Total Stream Miles Assessed:	37.1



View Segment Data

Wabash River — Water Quality Monitoring

Water Resource Inventory (305b Report) — Nonpoint Source Assessment

Group/Segment 63 1	Wabash River (Beaver Creek to Ohio/Indiana Line)
Stream Assessment Status:	NPS impaired
Sources of known or suspected impact:	agriculture, crop production, livestock pasture feedlots, channelization, on-site wastewater treatment systems
Aquatic Life Designated Use:	warmwater
Known sources of impairment:	Channelization, Nonirrigated crop production, Municipal Point Sources, Onsite wastewater systems (septic tanks).
Segment Length (miles):	3
Known causes of impairment:	habitat alterations, siltation

Group/Segment 63 2	Hickory Branch
Stream Assessment Status:	some info
Sources of known or suspected impact:	agriculture, crop production, livestock pasture feedlots, on-site wastewater treatment systems
Aquatic Life Designated Use:	warmwater
Segment Length (miles):	5

Group/Segment 63 3	Scherman Ditch
Stream Assessment Status:	some info
Sources of known or suspected impact:	agriculture, crop production, livestock pasture feedlots, on-site wastewater treatment systems
Aquatic Life Designated Use:	warmwater
Segment Length (miles):	5

Group/Segment 63 4	Beaver Creek (Grand Lake St. Marys to Wabash R.)
Stream Assessment Status:	PS & NPS impaired
Sources of known or suspected impact:	agriculture, crop production, livestock pasture feedlots, channelization, on-site wastewater treatment systems
Aquatic Life Designated Use:	warmwater
Known sources of impairment:	Municipal Point Sources, Channelization, Feedlots (Confined Animal Feeding Oper.).
Segment Length (miles):	11
Known causes of impairment:	organic enrichment D.O., habitat alterations

Group/Segment 63 5	Big Run
Stream Assessment Status:	some info
Sources of known or suspected impact:	agriculture, crop production, livestock pasture feedlots, on-site wastewater treatment systems
Aquatic Life Designated Use:	warmwater
Segment Length (miles):	5

Group/Segment 63 6	Brush Run
Stream Assessment Status:	some info
Sources of known or suspected impact:	agriculture, crop production, livestock pasture feedlots, on-site wastewater treatment systems
Aquatic Life Designated Use:	warmwater
Segment Length (miles):	2

Group/Segment 63 7	Little Beaver Creek
Stream Assessment Status:	some info
Sources of known or suspected impact:	agriculture, crop production, livestock pasture feedlots, on-site wastewater treatment systems
Aquatic Life Designated Use:	warmwater
Segment Length (miles):	6

Group/Segment 63 8	Little Bear Creek
Stream Assessment Status:	some info
Sources of known or suspected impact:	agriculture, crop production, livestock pasture feedlots, on-site wastewater treatment systems
Aquatic Life Designated Use:	warmwater
Segment Length (miles):	3

Group/Segment 63 9	Buck Run
Stream Assessment Status:	some info
Sources of known or suspected impact:	agriculture, crop production, livestock pasture feedlots, on-site wastewater treatment systems
Aquatic Life Designated Use:	warmwater
Segment Length (miles):	2

Wabash River Water Quality Monitoring

Water Resource Inventory (305b Report)

Definition of terms and abbreviations

Segment OH63 1	WABASH RIVER (BEAVER CREEK TO OHIO/INDIANA LINE)					
Segment Length			Drainage Area			
2.72 (miles)			285 (sq. miles)			
Attainment of Aquatic Life Use (monitored miles)						Sampling Year:
Fully	Threatened	Partial	Not Attaining	Not Assessed	Designation:	
0	0	0	2.7	0	WWH	1984
Causes of Impairment			Sources of Impairment			
Other habitat alterations [H].Siltation [M].Organic enrichment DO [S].			Channelization [H].Nonirrigated crop production [M].Municipal Point Sources [S].Onsite wastewater systems (septic tanks) [S].			

Segment OH63 2	HICKORY BRANCH					
Segment Length			Drainage Area			
4.6 (miles)			6.5 (sq. miles)			
Attainment of Aquatic Life Use (monitored miles)						Sampling Year:
Fully	Threatened	Partial	Not Attaining	Not Assessed	Designation:	
0	0	0	0	0	WWH	NONE
Causes of Impairment			Sources of Impairment			
Not Assessed			Not Assessed			

Segment OH63 3	SCHERMAN DITCH					
Segment Length			Drainage Area			
4.5 (miles)			3.5 (sq. miles)			
Attainment of Aquatic Life Use (monitored miles)						Sampling Year:
Fully	Threatened	Partial	Not Attaining	Not Assessed	Designation:	
0	0	0	0	0	WWH	NONE
Causes of Impairment			Sources of Impairment			
Not Assessed			Not Assessed			

Segment OH63 4	BEAVER CREEK (GRAND LAKE ST. MARYS TO WABASH R.)					
Segment Length			Drainage Area			
10.6 (miles)			249 (sq. miles)			
Attainment of Aquatic Life Use (monitored miles)						Sampling Year:
Fully	Threatened	Partial	Not Attaining	Not Assessed	Designation:	
0	0	0	10.4	0.2	WWH	1984
Causes of Impairment			Sources of Impairment			

Organic enrichment DO [H].Other habitat alterations [M].Unionized Ammonia [M].	Municipal Point Sources [H].Channelization [M].Feedlots (Confined Animal Feeding Oper.) [S].

Segment OH63 5	BIG RUN

Segment Length	Drainage Area
4.5 (miles)	4.7 (sq. miles)

Attainment of Aquatic Life Use (monitored miles)						Sampling Year:
Fully	Threatened	Partial	Not Attaining	Not Assessed	Designation:	
0	0	0	0	0	WWH	NONE

Causes of Impairment	Sources of Impairment
Not Assessed	Not Assessed

Segment OH63 6	BRUSH RUN

Segment Length	Drainage Area
2.4 (miles)	1.8 (sq. miles)

Attainment of Aquatic Life Use (monitored miles)						Sampling Year:
Fully	Threatened	Partial	Not Attaining	Not Assessed	Designation:	
0	0	0	0	0	WWH	NONE